

THAT WHICH IS CLAIMED IS:

1. A method for performing chest compression during cardiopulmonary resuscitation (CPR), comprising;

5 electrically stimulating a subject's heart during cardiopulmonary resuscitation;
and

compressing the heart at a selected time proximate to the delivery of the electrical stimulation to avoid compressing the heart during a vulnerable portion of the intrinsic cardiac cycle.

10 2. A method according to Claim 1, wherein the compressing step is initiated in advance of the electrical stimulation.

3. A method according to Claim 1, wherein the compressing step is initiated during the electrical stimulation.

15 4. A method according to Claim 3, wherein the compressing step is initiated after the electrical stimulation at a time that does not overlap with the T wave portion of a spontaneous intrinsic cardiac cycle.

20 5. A method according to Claim 1, wherein the electrical stimulation comprises applying a shock with an external defibrillator.

6. A method according to Claim 5, wherein electrical stimulation comprises applying a shock to the heart with an implantable defibrillator.

25 7. A method according to Claim 1, wherein compressing the heart comprises manually compressing the heart.

8. A method according to Claim 7, further comprising automatically
30 generating an audible alert when compression is to be initiated to direct a person to initiate manual compression.

9. A method according to Claim 8, wherein the manual compression is a closed chest manual compression.

10. A method according to Claim 8, wherein the manual compression is an
5 internal chest compression.

11. A method according to Claim 8, wherein the manual compression is an open chest compression.

10 12. A method according to Claim 1, wherein the compressing the heart comprises mechanically compressing the heart using a compression device.

13. A method according to Claim 12, further comprising automatically controlling the device to apply the mechanical compression based on the timing of the
15 electrical stimulation.

14. A method according to Claim 13, wherein the device is an external device residing on a closed chest of the subject.

20 15. A method according to Claim 13, wherein the device comprises an internal portion that automatically inflates and deflates to provide a minimally invasive direct cardiac massage.

16. A method according to Claim 14, wherein the external device comprises
25 an inflatable vest configured to compress the chest.

17. A system for performing chest compression during cardiopulmonary resuscitation (CPR), comprising;
means for electrically stimulating a subject's heart during cardiopulmonary
30 resuscitation; and

means for compressing the heart at a selected time proximate to the delivery of the electrical stimulation to avoid compressing the heart during a vulnerable portion of the intrinsic cardiac cycle.

5 18. A system according to Claim 17, wherein the means for compressing is configured to compress the heart at a time that does not overlap with the T wave portion of a spontaneous intrinsic cardiac cycle.

10 19. A system according to Claim 17, wherein the means for compressing the heart comprises a mechanically operated device.

20 20. A system according to Claim 19, further comprising means for automatically controlling the mechanically operated device to apply a mechanical compression responsive to the timing of the electrical stimulation.

15 21. A system according to Claim 20, wherein the device is an external device configured to reside about a closed chest of the subject.

20 22. A system according to Claim 20, wherein the device comprises an internal portion that is configured to automatically inflate and deflate to provide a minimally invasive direct cardiac massage.

25 23. A system according to Claim 20, wherein the means for stimulating comprises electrodes configured to engage a chest of the subject undergoing CPR.

24. A system according to Claim 23, wherein the means for stimulating comprises implantable electrodes positioned in the subject.

30 25. A system according to Claim 17, further comprising an audible indicator signal alerting as to when timing for compressing the heart is favorable.

26. A method for performing chest compression during cardiopulmonary resuscitation (CPR), comprising;

sensing a parameter corresponding to a measure of intrinsic spontaneous cardiac activity of a heart in a subject undergoing CPR; and

5 compressing the heart of the subject during a non-vulnerable portion of the intrinsic cardiac based on the sensed parameter thereby inhibiting reinduction of fibrillation and/or improving cardiac function.

27. A method according to Claim 26, wherein the sensing is carried out in
10 substantially real-time.

28. A method according to Claim 26, wherein the compressing step is initiated at a time that does not overlap with the T wave portion of a spontaneous intrinsic cardiac cycle.
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29. A method according to Claim 26, wherein the sensing step is carried out using a sensing electrode in communication with an external defibrillator.

30. A method according to Claim 26, wherein the sensing step is carried out using an internal sensing electrode in communication with an implantable defibrillator.
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31. A method according to Claim 26, wherein compressing the heart comprises manually compressing the heart.
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32. A method according to Claim 31, further comprising automatically generating an audible alert when compression is to be initiated to direct a person to initiate manual compression.

33. A method according to Claim 31, wherein the manual compression is a closed chest manual compression.
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34. A method according to Claim 31, wherein the manual compression is an internal chest compression.

35. A method according to Claim 31, wherein the manual compression is an
5 open chest compression.

36. A method according to Claim 26, wherein compressing the heart comprises mechanically compressing the heart using a compression device.

10 37. A method according to Claim 26, further comprising automatically controlling the device to apply the mechanical compression based on the timing of the intrinsic cardiac cycle as determined by the sensed parameter.

38. A method according to Claim 37, wherein the device is an external device
15 residing on a closed chest of the subject.

39. A method according to Claim 37, wherein the device comprises an internal portion that automatically inflates and deflates to provide a minimally invasive direct cardiac massage.

20 40. A method according to Claim 38, wherein the external device comprises an inflatable vest configured to compress the chest.

41. A system for performing chest compression during cardiopulmonary
25 resuscitation (CPR), comprising;

means for sensing a parameter corresponding to a measure of intrinsic spontaneous cardiac activity of a heart in a subject undergoing CPR; and

means for compressing the heart of the subject during a non-vulnerable portion of the intrinsic cardiac based on the sensed parameter.

30 42. A system for assisting in chest compression in a subject having cardiomalfuction, comprising:

at least one cardiac activity sensor in communication with the heart of a subject configured to detect a cardiac activity parameter; and

a controller in communication with the at least one sensing electrode, wherein, in operation, the at least one cardiac activity sensor transmits data to the controller
5 regarding a spontaneous intrinsic cardiac cycle of the subject and the controller identifies a favorable time to deliver a chest compression based on the transmitted sensor data.

43. A system according to Claim 42, wherein the controller identifies a time
10 that does not overlap with the T wave portion of a spontaneous intrinsic cardiac cycle.

44. A system according to claim 42, further comprising an audible alert in communication with the controller, the controller configured to output an audible alert signal responsive to an identified favorable time to deliver a chest compression to the
15 subject based on the transmitted sensor data.

45. A system according to Claim 44, further comprising a power supply in communication with the controller and a display configured to display a spontaneous intrinsic cycle and visually indicate a favorable time to deliver a chest compression
20 based on the transmitted sensor data.

46. A system according to Claim 42, further comprising a mechanical device configured to apply chest compression at selected intervals, the controller configured to automatically actively control the timing of the compression applied by the
25 mechanical device.

47. A system according to Claim 46, wherein the mechanical device is an external compression device.

30 48. A system according to Claim 46, wherein the mechanical device comprises an internal compression device.

49. A computer program product for timing the delivery of cardiac compression during CPR, the computer program product comprising:

a computer readable storage medium having computer readable program code embodied in said medium, said computer-readable program code comprising:

5 computer readable program code that determines a favorable time to deliver cardiac compression to a subject to avoid a vulnerable period of a spontaneous intrinsic cardiac cycle.

10 50. A computer program product according to Claim 49, further comprising computer readable program code that identifies when electrical stimulation is applied to the subject, wherein the computer readable program code that determines the favorable time is based on the time that the electrical stimulation is applied.

15 51. A computer program product according to Claim 49, further comprising computer readable program code that receives data corresponding to the spontaneous cardiac activity of the subject in substantially real time, wherein the computer readable program code that determines the favorable time is based on the received data.

20 52. A computer program product according to Claim 49, further comprising computer readable program code that outputs an audible alert when a favorable cardiac compression time is determined.

25 53. A computer program product according to Claim 52, further comprising computer readable program code that automatically directs the activation of a mechanical compression device in response to the determined favorable time.